

## **BACKGROUND OF THE INVENTION**

This invention relates to preventing flying insects, such as bees, wasps, hornets and the like, from entering and nesting in hollow fence components. In particular, this invention involves the blocking of a path that could be used by flying insects to enter a hollow fence post.

## **OBJECTIVES OF THE INVENTION**

Accordingly, it is an object of this invention to provide improved apparatus and methods for preventing insects from nesting in hollow structures.

Another object is to provide a resilient plug that will fit into an open sided fence component in a way that prevents insects from passing through an opening in another fence component.

An additional object is to provide a plug that is placed into space-blocking relationship within a fence part by sliding the plug in a direction that is perpendicular to the longitudinal central axis of the plug.

Another object is to provide improved hollow fences in which flying insects are discouraged from building nests.

Another object is to provide a plug with flexible, flat, noncircular, non tapered shoulders that hold the plug in place.

A further object is to provide methods of non axially sliding plugs into insect path blocking positions in hollow structures.

An additional object is to provide plugs that are reusable after some of the flexible shoulders on the plug have been bent out of shape.

A further object is to provide fences with insect stopping plugs and structural components that are durable, economical, easy to use and maintain and replace, and which do not possess defects found in similar prior art fences and insect deterring products.

Other objects and advantages of the plugs, fences and methods incorporating this invention will be found in the specification and claims and the scope of the invention will be set forth in the claims.

### **DESCRIPTION OF THE DRAWING**

Fig. 1 is a perspective view of an embodiment of a plug in accord with this invention.

Fig. 2 is a cross sectional view of the plug shown in Fig. 1.

Fig. 3 is schematic, partially broken away, partially cross sectional fragmentary elevational view of a fence in accord with this invention.

Fig. 4 is an enlarged cross sectional view taken along the line 4-4 in Fig. 3.

Fig. 5 is an end view of the rail of this invention.

Fig. 6 a fragmentary, schematic side view of a plug and rail aligned in parallel planes in accord with this invention.

### **DESCRIPTION OF THE INVENTION**

The drawing shows an integral, resilient, hollow plug 5 for substantially filling and blocking openings in a hollow rectangular rail 6 and an interconnected hollow rectangular post 7 of a fence 8 that has spaced hollow rectangular pickets 9. The post 7 has a flat side 10, and a rectangular holes 11 in side 10 for insertion of rails 6. The hole 11 is sufficiently large to permit flying insects such as bees, wasps and the like to enter and nest in the post.

Rectangular rail 6 has an open terminal ends 14. Rail 6 has three continuous elongated flat sides that have the same length. One side 15 is horizontal, the remaining two sides 16 and 17 being vertical and parallel to each other. Rail 6 has another side 18 that is open to the atmosphere for its entire length. The sides 16 and 17 are joined to each other at right angles at their corners 19 so that

the rail has the configuration of a three sided square with one open side that faces downwardly. Sides 16 and 17 have bottom locator notches 20 and 21 that reduce the size of the rail at open end 14. Each of the flat sides 15-17 has an inside surface 22 that is exposed to the atmosphere through open side 18. Vertical sides 16 and 17 have longitudinally extending ledges 23 and 24 at their lower end that project from their inside surfaces 22 toward each other into open side 18. Each ledge has an upper surface 25. Side 17 has a pair of parallel longitudinally extending ribs 26 and 27 on its inside surface 22 that project perpendicularly from surface 22 toward side 16. Ribs 26 and 27 have lower surfaces 28 and 29, respectively. The upper surface 25 of ledge 23 and the lower surfaces 28 and 29 of the ribs are parallel.

The hole 11 is just slightly larger than the reduced size of rail 6 at the notched open end 14. As shown in Fig. 3, a rail 6 has been inserted into a hole 11 in post 7 until the notches 20 and 21 touch the side 10, with the open side 18 of the rail facing downwardly. A threaded fastener 31 secures rail 6 in post 7. The pickets 9 extend upwardly through the open side 18 of rail 6 and through spaced holes 30 in rail 6, where the pickets are secured in place by threaded fasteners 32. The use of the notches 20 and 21 as stops that position the holes 30 of each rail 6 the same distance from the side 10 ensures that corresponding holes 30 in other rails that have been inserted into other holes 11 will all be aligned vertically. The result is that the pickets 9 will be parallel to each other and to the post 7. The open side 18 of rail 6 and the open terminal end 14 of the rail provide a continuous atmospheric path that would enable flying insects to enter and nest in post 5 through the hole 11, if that path were not blocked. Only one rail 6 has been shown to simplify the drawing.

This invention uses the plug 5 to block the insect invasion path through the rail and post. The plug 5 should be made from a durable, weather resistant, flexible rubber or plastic material, such as neoprene, polyethylene, polypropylene, PVC or the like. Plug 5 has a main body portion 35 that has a central longitudinal axis 36 and four identical sides 37 having the same length, width and thickness. The sides 37 are joined to each other at right angles at their corners 38 so that the body 35 is a hollow cube with one end 39 open to the atmosphere and the other end closed by an end cap 40.

Four identical shoulders 41 of uniform thickness protrude from and surround body 35. The shoulders 41 are spaced from each other at equal predetermined distances along the axis 11. Each of the shoulders has a segment 42 that is integral with one of the four sides of the body 35. The segments 42 are joined to each other at a right angle at each of their ends 43 so that each shoulder continuously circumscribes the body 35. Each of the segments 42 has a continuous upper flat surface 44 and a continuous lower flat surface 45. As shown in Fig. 2, all of the upper and lower flat surfaces 44 and 45 extend perpendicularly from the sides 37 of body 35 in parallel planes that are perpendicular to the longitudinal axis 36. The upper and lower flat surfaces 44 and 45 of each segment 42 have flat outer edges 46 that terminate at the same distance 47 from the sides 37 of body 35. When the plug 5 is used to block the insect path, the shoulder 48 is the uppermost shoulder and the shoulder 49 is the lowermost.

As shown in Fig. 2, end cap 40 has a flat inner surface 50 that is integral with body 35, and this inner surface is parallel to the parallel planes of flat surfaces 44 and 45 of segments 42. End cap 40 has outer peripheral edges 51 that extend past body 35 beyond the distance 47 that the outer edges 46 terminate past the sides 37

of body 35.

As shown in Fig. 6, when the axis 36 of plug 5 is oriented parallel to the sides 16 and 17 of rail 6 and perpendicularly to the rail side 15, the upper and lower flat surfaces 44 and 45 of the segments 42 and the surface 50 of the cap 40 will be in planes that are parallel to the ribs 26 and 27 and the ledges 25 inside of rail 6. As shown in Fig. 5, the ribs 26 and 27 and ledges 27 are exposed through the open end 14 of the rail 6. Plug 5 should have a side 37 aligned with open end 14, and then the plug can be inserted onto the rail by moving it in a path 52 that is parallel to the parallel ribs 26 and 27 and ledges 25 and is perpendicular to its axis 36. The plug 5 should continue to be slid into rail 6 in the parallel path 52 until some of the shoulders 41 engage a rib 26 and ledge 25 with sufficient friction to hold the plug inside the rail. Sliding of the plug into the rail should continue and should be stopped when the side of the plug facing the open end 14 is substantially aligned with the inner edges of the notches 20 and 21. This ensures that the plug 5 will be sufficiently close to the post 7 in a position where it will block the insect entry path into the post after the rail 6 has been attached to the post.

The friction fit that holds the plug 5 in rail 6 may be attained by predetermining the distances separating a ledge 25 and one rib 26, and the distances separating, and the location of, the uppermost and lowermost shoulders 48 and 49 on the plug 5. The upper surface 25 of ledge 23 and the lower surface 28 of rib 27 are spaced apart inside of said rail by a first a predetermined distance 53. The predetermined distances separating the shoulders 41 on plug 5 are set so that the upper flat surface 44 of segments 42 of the uppermost shoulder 48 are spaced from the lower flat surface 45 of the corresponding segment 42 of the lowermost shoulder 49 by a

predetermined second distance 54. When the plug 5 has been slid along the path 52 into the open end of rail 6, the upper flat surface 44 of one segment 42 of uppermost shoulder 48 engages the underside 28 of rib 27, and the lower flat surface 45 of another corresponding segment 42 on lowermost shoulder 49 engages the upper surface 25 of ledge 23. By making the predetermined distance 54 separating an upper surface 44 of one segment from the lower surface 45 of a corresponding segment slightly greater (e. g. 1 mm) than the predetermined distance 53 that separates the lower surface 28 of rib 27 from the upper surface 25 of ledge 23 results in the friction fit between plug 5 and rail 6 that securely holds the plug inside of said rail.

After a plug 5 has been used inside of a rail 6, if removal of the plug reveals that the segments 42 that were frictionally engaged between the ledge 23 and rib 27 have been bent out of shape or otherwise damaged, the plug 5 can be rotated ninety degrees and a different pair of segments 42 can be slid into frictional engagement with the rib and ledge, thus extending the useful life of the plug. The friction fit between plug and rail is strong enough to hold the plug in its insect blocking position during prolonged exposure to the outdoor weather conditions the plug encounters in the open side 18 of rail 6.

While the present invention has been described with reference to particular embodiments and methods, it is not intended to illustrate or describe all of the equivalent forms or ramifications thereof. Also, the words used are words of description rather than limitation, and various changes may be made without departing from the spirit or scope of the invention disclosed herein. It is intended that the appended claims cover all such changes as fall within the true spirit and scope of the invention.